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EXAMINER

CURS, NATHAN M

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/642,602	Applicant(s) FUTAMI ET AL.	
	Examiner NATHAN M. CURS	Art Unit 2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 March 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 and 17 is/are rejected.
- 7) ☒ Claim(s) 16 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3, 5-9 and 11-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant Admitted Prior Art ("AAPA") (specification fig. 15 and page 1, line 17 to page 5, line 2 and page 9, lines 9-18) in view of Kajiya et al. ("Kajiya") (US Patent No. 7092643).

Regarding claim 1, AAPA discloses a separating apparatus for time division multiplexed signal light, which is input with time division multiplexed signal light obtained by multiplexing a plurality of signal lights on a time axis (fig. 15 with the TDM signal light input and page 3 lines 22-23), and guides said time division multiplexed signal light, respectively, to a first optical gate section in which the transmittance thereof is periodically changed in accordance with a repetition frequency of "n" times a bit rate of a said signal light of said plurality of signal lights (n is a positive integer excluding 1) (fig. 15, element 101 and page 3, line 33 to page 4, line 4, for n = 2, where the signal light is 10 Gbps, creating a 10 GHz receiver signal synchronous with the signal light, and where the transmittance of the first optical gate is changed at 20 GHz), and to a second optical gate section connected in series to said first optical gate section, in which the transmittance thereof is periodically changed in accordance with a repetition frequency equal to the bit rate of said signal light of the plurality of signal lights (fig. 15, element 102 and page 4, lines 4-9, where the transmittance of the second optical is changed at 10 GHz synchronous with

Art Unit: 2613

the signal light), to separate at least one signal light included in said time division multiplexed signal light on the time axis (page 3, lines 22-31), wherein said first optical gate section comprises: a first optical gate in which an optical transmission characteristic thereof with respect to a drive voltage is periodically changed (fig. 15, element 101 and page 3, line 33 to page 4, line 4), and a first drive circuit that supplies to said first optical gate a drive signal having a repetition frequency twice the bit rate of said signal light of the plurality of signal lights (fig. 15, elements 108, 105 and 106 and page 4, lines 4-9), and having the voltage magnitude corresponding to a voltage difference in $1/2$ period in the periodic optical transmission characteristic of said first optical gate (page 3 line 33 to page 4 line 4, where the voltage magnitude corresponds to no transmittance at the minimum point and full transmittance at the maximum point, or vice versa, each voltage magnitude transition thus corresponding to a voltage difference in $1/2$ period of the transmissions characteristic of the first optical gate – where a full period of the transmission characteristic of the first optical gate would be from no transmittance to full transmittance back to no transmittance, or full transmittance to no transmittance back to full transmittance). AAPA discloses EA optical modulators for TDM separating/demultiplexing where each EA optical modulator is used as an on/off gate (page 3, lines 15-31), but does not disclose that the drive signal to the first modulator has a frequency equal to that of the bit rate of the signal light and having the voltage magnitude corresponding to a voltage difference in an $n/2$ period in the periodic optical transmission characteristic of said first optical gate. Kajiya discloses an MZ optical modulator used as an on/off gate, and where the output signal frequency of the modulator is twice the driving signal input frequency when the modulation factor is doubled, and where the doubled modulation factor results in a drive signal voltage magnitude corresponding to a voltage difference in an $n/2$ period in the periodic optical transmission characteristic (page 1, lines 18-65, where n equals 2, corresponding to twice the

Art Unit: 2613

bit rate of the signal light, and thus “ $n/2$ period” equals one period; the doubled modulation factor means that the resulting voltage magnitude corresponds to one full period of the transmission characteristic of the MZ modulator -- from no transmittance to full transmittance back to no transmittance, or vice versa – which is how a 10 GHz drive signal can produce a 20 GHz modulation). It would have been obvious to one of ordinary skill in the art at the time of the invention to use an MZ optical modulator in place of the first EA modulator of AAPA, removing the frequency doubler of AAPA, and doubling the modulation factor of the drive signal to the resulting MZ optical modulator, to provide the benefit of producing the doubled transmittance frequency for the first modulator using the existing bit rate of the received signal light and using less circuitry; namely, without requiring the frequency doubler element.

Regarding claim 2, the combination of AAPA and Kajiya discloses a separating apparatus according to claim 1, wherein said first optical gate is a Mach-Zehnder optical modulator (Kajiya: page 1, lines 18-65 as applicable to the combination).

Regarding claim 3, the combination of AAPA and Kajiya discloses a separating apparatus according to claim 2, wherein said Mach-Zehnder optical modulator is constructed using a substrate made of lithium niobate (Kajiya: col. 1, lines 28-36).

Regarding claim 5, the combination of AAPA and Kajiya discloses a separating apparatus according to claim 2. The combination as described for claims 1 and 2 does not disclose that said Mach-Zehnder optical modulator is constructed using a material which enables a polarization independent operation. However, AAPA discloses that polarization independent InP MZ modulators are conventional (AAPA: page 9, lines 9-18). It would have been obvious to one of ordinary skill in the art at the time of the invention to use an InP MZ modulator for the modulator of the combination, to provide the benefit of polarization independent modulation.

Art Unit: 2613

Regarding claim 6, the combination of AAPA and Kajiya discloses a separating apparatus according to claim 5, wherein said Mach-Zehnder optical modulator is constructed using a substrate made of indium phosphorus (Kajiya: col. 9, lines 9-18 as applicable in the combination).

Regarding claim 7, the combination of AAPA and Kajiya discloses a separating apparatus according to claim 1, wherein said first drive circuit generates a drive signal to be supplied to said first optical gate, by adjusting a phase and voltage magnitude of an electric clock having a repetition frequency equal to the bit rate of said signal light of the plurality of signal lights extracted based on the signal light of the plurality of signal lights having passed through said first and second optical gate sections (AAPA: fig. 15, elements 108 and 106 and bias circuit and page 3, line 33 to page 4, line 22).

Regarding claim 8, the combination of AAPA and Kajiya discloses a separating apparatus according to claim 1, wherein said second optical gate section comprises a second optical gate in which an optical transmission characteristic thereof with respect to a drive voltage is periodically changed, and a second drive circuit that supplies to said second optical gate a drive signal having a repetition frequency equal to the bit rate of said signal light of the plurality of signal lights (AAPA: fig. 15, element 102 and page 4, lines 4-9).

Regarding claim 9, the combination of AAPA and Kajiya discloses a separating apparatus according to claim 8, wherein said second optical gate is an electro-absorption type optical gate (AAPA: fig. 15 and page 4, lines 4-9).

Regarding claim 11, the combination of AAPA and Kajiya discloses a separating apparatus according to claim 8, wherein said second drive circuit generates a drive signal to be supplied to said second optical gate, by adjusting a phase and voltage magnitude of an electric clock having a repetition frequency equal to the bit rate of said signal light of the plurality of

Art Unit: 2613

signal lights extracted based on the signal light of the plurality of signal lights having passed through said first and second optical gate sections (AAPA: fig. 15 elements 108 and 107 and col. 3, lines 4-9).

Regarding claim 12, AAPA discloses an optical receiving apparatus, which is input with time division multiplexed signal light obtained by multiplexing a plurality of signal lights on a time axis (fig. 15 with the TDM signal light input and page 3 lines 22-23), and comprises: a clock extracting unit extracting a clock having a repetition frequency equal to a bit rate of said signal light of the plurality of signal lights, based on said time division multiplexed signal light (fig. 15, element 100A and page 3, lines 22-31); and a signal light receiving unit separating said respective signal light included in said time division multiplexed signal light on the time axis to perform reception processing, wherein at least one of said clock extracting unit and said signal light receiving unit includes a separating apparatus for time division multiplexed signal light according to claim 1 (fig. 15 and page 3, line 15 to page 4, line 22), except that AAPA discloses EA optical modulator on/off gates for TDM separating/demultiplexing (page 3, lines 15-31), and does not disclose that the drive signal to the first modulator has a frequency equal to that of the bit rate of the signal light and having the voltage magnitude corresponding to a voltage difference in an $n/2$ period in the periodic optical transmission characteristic of said first optical gate. However, Kajiya discloses an MZ optical modulator used as an on/off gate, and where the output signal frequency of the modulator is twice the driving signal input frequency when the modulation factor is doubled, and where the doubled modulation factor results in a drive signal voltage magnitude corresponding to a voltage difference in an $n/2$ period in the periodic optical transmission characteristic (page 1, lines 18-65, where n equals 2, corresponding to twice the bit rate of the signal light, and thus " $n/2$ period" equals one period; the doubled modulation factor means that the resulting voltage magnitude corresponds to one full period of the

Art Unit: 2613

transmission characteristic of the MZ modulator -- from no transmittance to full transmittance back to no transmittance, or vice versa -- which is how a 10 GHz drive signal can produce a 20 GHz modulation). It would have been obvious to one of ordinary skill in the art at the time of the invention to use an MZ optical modulator in place of the first EA modulator of AAPA, removing the frequency doubler of AAPA, and doubling the modulation factor of the drive signal to the resulting MZ optical modulator, to provide the benefit of producing the doubled transmittance frequency for the first modulator using the existing bit rate of the received signal light and using less circuitry; namely, without requiring the frequency doubler element.

Regarding claim 13, the combination of AAPA and Kajiya discloses an optical receiving apparatus according to claim 12, wherein said clock extracting unit and said signal light receiving unit are respectively provided for each of said plurality of signal lights included in said time division multiplexed signal light (AAPA: page 3, lines 15-31).

Regarding claim 14, the combination of AAPA and Kajiya discloses an optical receiving apparatus according to claim 12, wherein said clock extracting unit is shared with two or more signal lights included in said time division multiplexed signal light (AAPA: fig. 15, element "10Ghz electric clock").

Regarding claim 15, the combination of AAPA and Kajiya discloses an optical transmission system, wherein time division multiplexed signal light obtained by multiplexing a plurality of signal lights on a time axis is transmitted from an optical transmission apparatus to an optical transmission line, and said time division multiplexed signal light transmitted via said optical transmission line is received by the optical receiving apparatus recited in claim 12 (AAPA: fig. 15 and page 3 line 22 to page 4, line 9).

Art Unit: 2613

3. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA (specification fig. 15 and page 1, line 17 to page 5, line 2 and page 9, lines 9-18) in view of Kajiya (US Patent No. 7092643) as applied to claims 1-3 and 5-15 above, and further in view of Way (US Patent Application Publication No. 2002/0135838).

Regarding claim 4, the combination of AAPA and Kajiya discloses a separating apparatus according to claim 3, but does not disclose a polarization control section that controls a polarization state of the time division multiplexed signal light input to said Mach-Zehnder optical modulator, to be constant. Way discloses a polarization controller used to control polarization of a signal entering an MZ modulator (fig. 1, elements 118 and 120 and paragraph 0021). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a polarization controller with the MZ modulator of the combination, to provide the benefit of controlling polarization of the signals entering the polarization dependent MZ modulator, as taught by Way.

4. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA (specification fig. 15 and page 1, line 17 to page 5, line 2 and page 9, lines 9-18) in view of Kajiya (US Patent No. 7092643) as applied to claims 1-3, 5-9 and 11-15 above, and further in view of Kartalopoulos (Kartalopoulos. *Introduction to DWDM Technology: Data in a Rainbow*. NJ, IEEE Press, 2000, page 109).

Regarding claim 10, the combination of AAPA and Kajiya discloses a separating apparatus according to claim 8, wherein said second optical gate is an EA optical modulator, and said second drive circuit supplies to said second optical gate a drive signal having the voltage magnitude corresponding to a voltage difference of a 1/2 period in the periodic optical transmission characteristic of said second optical gate (fig. 15, and col. 4, lines 4-9). The

Art Unit: 2613

combination as described for claims 1 and 8 does not disclose that said second optical gate is a Mach-Zehnder optical modulator. Kartalopoulos discloses optical modulators for on/off signaling, including MZ and EA optical modulators (page 109). It would have been obvious to one of ordinary skill in the art at the time of the invention to use an MZ modulator as an engineering design choice in implementing the second on/off modulator already disclosed by AAPA. Considering the disclosure of Kartalopoulos, it's clear the type of optical modulator claimed for the second modulator merely amounts to the selection of expedients known as design choices to one of ordinary skill in the art.

5. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA (specification fig. 15 and page 1, line 17 to page 5, line 2 and page 9, lines 9-18) in view of Kajiya (US Patent No. 7092643), and further in view of Mikkelsen et al. ("*Mikkelsen*") (*320-Gb/s single-channel pseudolinear transmission over 200 km of nonzero-dispersion fiber*; Mikkelsen et al.; Photonics Technology Letters, IEEE; Volume 12, Issue 10, Oct. 2000, pages 1400-1402), and further in view Griffin (US Patent Application Publication No. 2004/0081470).

Regarding claim 17, AAPA discloses a separating apparatus for time division multiplexed signal light, which is input with time division multiplexed signal light obtained by multiplexing a plurality of signal lights on a time axis (fig. 15 with the TDM signal light input and page 3 lines 22-23), and guides said time division multiplexed signal light, respectively, to a first optical gate section in which the transmittance thereof is periodically changed in accordance with a repetition frequency of "n" times a bit rate of a said signal light of said plurality of signal lights (fig. 15, element 101 and page 3, line 33 to page 4, line 4, for $n = 2$, where the signal light is 10 Gbps, creating a 10 GHz receiver signal synchronous with the signal light, and where the transmittance of the first optical gate is changed at 20 GHz), and to a second optical gate

Art Unit: 2613

section connected in series to said first optical gate section, in which the transmittance thereof is periodically changed in accordance with a repetition frequency equal to the bit rate of said signal light of the plurality of signal lights (fig. 15, element 102 and page 4, lines 4-9, where the transmittance of the second optical is changed at 10 GHz synchronous with the signal light), to separate at least one signal light included in said time division multiplexed signal light on the time axis (page 3, lines 22-31), wherein said first optical gate section comprises: a first optical gate in which an optical transmission characteristic thereof with respect to a drive voltage is periodically changed (fig. 15, element 101 and page 3, line 33 to page 4, line 4), and a first drive circuit that supplies to said first optical gate a drive signal having a repetition frequency twice the bit rate of said signal light of the plurality of signal lights (fig. 15, elements 108, 105 and 106 and page 4, lines 4-9), and having the voltage magnitude corresponding to a voltage difference in $1/2$ period in the periodic optical transmission characteristic of said first optical gate (page 3 line 33 to page 4 line 4, where the voltage magnitude corresponds to no transmittance at the minimum point and full transmittance at the maximum point, or vice versa, each voltage magnitude transition thus corresponding to a voltage difference in $1/2$ period of the transmissions characteristic of the first optical gate – where a full period of the transmission characteristic of the first optical gate would be from no transmittance to full transmittance back to no transmittance, or full transmittance to no transmittance back to full transmittance). AAPA discloses EA optical modulators for TDM separating/demultiplexing where each EA optical modulator is used as an on/off gate (page 3, lines 15-31), but does not disclose that the drive signal to the first modulator has a frequency equal to that of the bit rate of the signal light and having the voltage magnitude corresponding to a voltage difference in an $n/2$ period in the periodic optical transmission characteristic of said first optical gate. Kajiya discloses an MZ optical modulator used as an on/off gate, and where the output signal frequency of the

Art Unit: 2613

modulator is twice the driving signal input frequency when the modulation factor is doubled, and where the doubled modulation factor results in a drive signal voltage magnitude corresponding to a voltage difference in an $n/2$ period in the periodic optical transmission characteristic (page 1, lines 18-65, where n equals 2, corresponding to twice the bit rate of the signal light, and thus " $n/2$ period" equals one period; the doubled modulation factor means that the resulting voltage magnitude corresponds to one full period of the transmission characteristic of the MZ modulator -- from no transmittance to full transmittance back to no transmittance, or vice versa -- which is how a 10 GHz drive signal can produce a 20 GHz modulation). It would have been obvious to one of ordinary skill in the art at the time of the invention to use an MZ optical modulator in place of the first EA modulator of AAPA, removing the frequency doubler of AAPA, and doubling the modulation factor of the drive signal to the resulting MZ optical modulator, to provide the benefit of producing the doubled transmittance frequency for the first modulator using the existing bit rate of the received signal light and using less circuitry; namely, without requiring the frequency doubler element. The combination of AAPA and Kajiya does not disclose that the transmittance of the first optical gate is periodically changed in accordance with a repetition frequency of greater than 2 times the bit rate of the signal light. However, Mikkelsen discloses TDM demultiplexing generally similar to that of AAPA, but for a 320 Gbps signal instead of 160 Gbps signal, where the transmittance of the first optical gate is periodically changed in accordance with a repetition frequency 4 times the bit rate of one of the signal lights of the TDM signal, i.e. where " n " = 4 (fig. 1 and page 1401, the paragraph spanning cols. 1 and 2). Further, Griffin discloses a general fact about MZ optical intensity modulators; namely, that they have an optical transmission versus drive voltage characteristic which is cyclic and is generally raised cosine in nature, where the half period of the MZ modulator characteristic, which is measured in terms of a drive voltage, is defined as V_p . Based on Griffin, one of ordinary skill in the art would have

Art Unit: 2613

recognized that the doubled modulation factor of the drive signal of the MZ modulator of the combination corresponds to the inherent cyclic, raised cosine drive voltage characteristic of that MZ modulator. And further in light of the Mikkelsen teaching, of a transmittance frequency 4 times the bit rate of one of the signal lights of a 320 Gbps TDM signal, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the doubled modulation factor drive voltage of the MZ modulator of the combination to be a *quadrupled* modulation factor drive voltage, increasing the transmittance frequency of the MZ modulator of the combination further to provide the benefit of a TDM demultiplexer than can demultiplex a 320 Gbps TDM signal.

Allowable Subject Matter

6. Claim 16 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

7. Applicant's arguments filed 4 March 2008 have been fully considered but they are not persuasive.

As an initial matter, in the Remarks page 6 lines 12-13 the Applicant first states that in Kajiya, "a modulation factor is set as a suitable bias voltage" (emphasis Applicant's). However, Kajiya sets a modulation factor and a bias voltage (col. 1 lines 46-49 and lines 54-56); the modulation factor and bias voltage are not the same thing.

In the Remarks page 7 lines 1-2 the Applicant argues that the gate of amended claim 1 transmits the TDM signal light, concluding from this that Kajiya fails to teach or suggest the

Art Unit: 2613

separating apparatus of claim 1. However, the rejection is based on the combination of AAPA and Kajiya, not Kajiya alone. When the first EA modulator of AAPA is replaced by the MZ modulator of Kajiya as described in the combination, the TDM signal that was previously input to the EA modulator is now input into the MZ modulator as the source signal for the MZ modulator, and the on/off gating of the previous EA modulator is replaced by the on/off gating of the MZ modulator. The Kajiya-type MZ modulator, in the context of the combination is gating and transmitting the TDM light.

In the Remarks page 7 lines 3-7 the Applicant argues that claim 1 is patentably distinguished over the cited art because the Examiner admitted that AAPA does not disclose that "the drive signal to the first modulator has a frequency equal to that of the bit rate of the signal light and having the voltage magnitude corresponding to a voltage difference in a $n/2$ period in the periodic optical transmission characteristic of said first optical modulator". However, this argument is not persuasive because the rejection of claim 1 is based on the combination of AAPA and Kajiya, not just AAPA. Although AAPA doesn't anticipate claim 1, claim 1 is still unpatentable over the combination of AAPA and Kajiya, as described above.

Conclusion

8. Any inquiry concerning this communication from the examiner should be directed to N. Curs whose telephone number is (571) 272-3028. The examiner can normally be reached on M-F (from 9 AM to 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan, can be reached at (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Art Unit: 2613

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pairdirect.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/NATHAN M CURS/

Examiner, Art Unit 2613